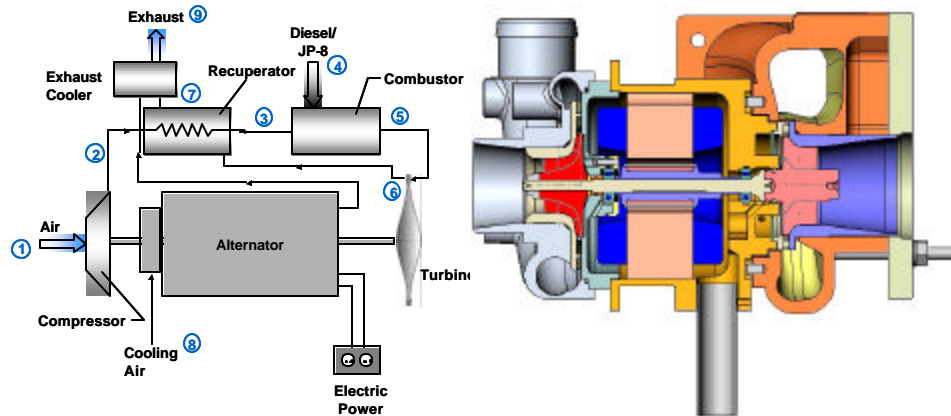


- ✓ Thermodynamic full-system analysis.
- ✓ Gas dynamic design of the compressor and turbine.
- ✓ Structural design of all rotating components.
- ✓ Subsystems (compressor, turbine and alternator) testing on propane at the end of the first year.
- ✓ Noise assessment and reduction tests.
- ✓ JP8 burner analysis and test.
- ✓ Full system testing.
- ✓ Maximum use of COTS components to reduce procurement costs.

- ✓ Extending the scientific knowledge of turbulent heterogeneous combustion to small-scale systems.
- ✓ The volume and residence time available for fuel (JP8) drop combustion are both very small. No data is currently available that will enable the direct engineering design of this combustor. Fuel atomization and combustion experiments will be conducted as part of the combustor development
- ✓ The gas-dynamic design of the turbine and compressor, the rotor dynamics of the compressor-alternator-turbine assembly and its bearing systems may require new technology to fully meet downstream goals.

TASKS	FY 02		FY 03				FY 04		
	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3
Overall design of 3 kW mini-turbine power system (diesel fuel)									
Compressor - turbine design for test system									
Manufacture all test hardware									
Turbine & compressor tests	 								
System tests (propane)									
Design, fabricate and test diesel/JPX fueled combustor									
Procure alternator & power elect.									
Design, fabricate, test recuperator	 								
Test breadboard system									
Complete packaging & noise isolation design									
Integrate components									
Conduct lab prototype tests	 								
Conduct field prototype tests									

USMC 3 kW Mini-Brayton Power Source



OBJECTIVES:

- Develop component technologies for compact mini-Brayton power system.
- Develop a very compact, lightweight, economical 3 kW Brayton cycle electric power generator for USMC use.
- Demonstrate system size, weight and fuel consumption goals in laboratory and field tests.

PAYOFFS:

- Reduce Tactical Quiet Generator (TQG) size by up to 7:1.
- Reduce TQG weight up to 4:1.
- Substantially eliminate low frequency (< 1 kHz) radiated noise; reduce high frequency noise (≥ 3 kHz) by 3-5 dB.

TECHNICAL APPROACH:

- Conduct cycle optimization studies.
- Test turbine-compressor assembly using facility propane combustor without a recuperator.
- Design, fabricate and test JP-8 fueled, recuperated system.
- Implement compact packaging; conduct laboratory and field tests of deliverable unit.

PERFORMERS: ARL Penn State,
Barber Nichols, Inc.

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